Prevention of anxiety among at-risk children: a systematic review and meta-analysis

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Review: Prevention of anxiety among at-risk children and adolescents – a systematic review and meta-analysis

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Background: Anxiety disorders are common, often start in childhood and run a chronic course. As such there is a need for effective prevention. **Methods:** We conducted a systematic review and meta-analyses of randomized, controlled trials to prevent the onset of anxiety disorders in 'at risk' young people. Diagnostic and symptom outcomes were examined. Putative moderators were tested as was publication bias. **Results:** We included 16 trials (2545 young people). Two trials reported diagnostic outcomes, and significant effects were found for these at end-of-programme (RR = .09, 95%CI = .02 to .16), 6- (RR = .17, 95%CI = .06 to .27) and 12-month (RR = .31, 95%CI .17 to .45) follow-ups. Based on 16 trials, improved anxiety symptoms were significant compared to nonattention controls only, with small effect sizes reported by young people at the end-of-programmes, 6- and 12-month follow-ups; and by parents at the end of the programmes and 12-, but not 6-, month follow-ups. There was no evidence of significant moderation or publication bias. **Conclusions:** Fourteen studies included children and young people who presented with elevated anxiety symptoms, but anxiety disorder was not ruled out in the participants in these studies. Hence, these studies might be reporting results of mixed prevention/early intervention programmes. Prevention programmes that target developmental risk factors, not only disorder maintaining factors, appear most promising. The clinically meaningful impact of anxiety disorder prevention programmes remains unknown.

Key Practitioner Message

- Prevention programmes appear to have greatest impact where young people are identified based on multiple risk factors for developing an anxiety disorder.
- Diagnostic outcomes must be assessed to obtain a clearer picture of programme effectiveness.
- Future studies examining modification of risk factors and mediators of change are required.

Keywords: Anxiety; meta-analysis; prevention; risk factors

Introduction

Anxiety disorders are among the most common mental health difficulties across the life span, with a lifetime prevalence of 28.8% (Kessler et al., 2005). They commonly emerge during childhood or adolescence, with approximately 50% of those affected first experiencing difficulties before 11 years of age (Kessler et al., 2005) and a worldwide prevalence of 6.5% (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015). This high prevalence is concerning because childhood anxiety disorders often run a chronic course, are associated with substantial interference in young peoples' social, educational and family lives, and are a risk for the development of other mental health problems in later life (Bittner et al., 2007; Pine, Cohen, Gurley, Brook, & Ma, 1998; Woodward & Fergusson, 2001). Effective interventions for childhood anxiety disorders have been established (e.g. James, James, Cowdrey, Soler, & Choke, 2013) but are accessed by relatively few children and adolescents in need (Merikangas et al., 2011). Furthermore, a significant minority of those that do access treatments either terminate treatment prematurely or do not benefit (James et al., 2013). Intervening to prevent the emergence of anxiety problems among children and young people at risk of their development brings potential advantages from intervening before patterns of responding (among the child and those around them) become ingrained and more difficult to reverse (Donovan & Spence, 2000), and by reducing the burden on families and services by minimizing the distress and costs associated with childhood anxiety disorders, including missed days at school, lost parent productivity and a broad range of other health and social care costs (Creswell, Cruddace et al., 2015).

While terms and definitions vary, mental health prevention has typically been classified as 'universal', 'selective' or 'indicated' (e.g. Haggerty & Mrazek, 1994). Universal prevention targets whole populations that have not been identified on the basis of any particular risk factors, 'selective' prevention targets subgroups that are at risk of developing the target disorder and 'indicated' prevention targets those at high risk who have

detectable symptoms of the disorder (Haggerty & Mrazek, 1994). Recent reviews have highlighted the potential value of prevention across each of these levels for child internalizing problems (e.g. Stockings et al., 2016), however, when it comes to anxiety specifically the findings are far from compelling. Of note, the majority of studies that focus on reducing anxiety were carried out on a universal basis. In a recent meta-analysis, there was evidence of a significant reduction in the risk of anxiety disorders following universal programmes, however, only immediately after the intervention (not at later time points), and there was a high level of heterogeneity between studies (Stockings et al., 2016). While the effect size was respectable in relation to other universal interventions (Relative Risk (RR) = 0.25 95% CI = .01 to .65), the degree to which clinically meaningful symptoms are reduced in those that need it remains modest. This potential limitation of the universal approach was highlighted in a recent large, UK study of school-based universal prevention in which children who had *low* levels of anxiety symptoms at baseline reported significantly greater reductions in anxiety following an intervention delivered by health professionals compared to those who received the intervention from school staff or received usual school provision, but there was no significant benefit for those who had *high* scores at baseline and who might be considered to be at greatest risk of developing a disorder (Stallard et al., 2014). These findings might suggest that, while universal programmes may bring general benefits in increasing well-being (and potentially improving mental health awareness) across the broader community, they might not be effective in reducing the risk of clinical levels of anxiety among those who are at risk.

In contrast to universal prevention, selected and indicated prevention target those who are more likely to develop anxiety disorders on the basis of risk factors (selective) and elevated symptoms (indicated). Recent reviews have identified few studies that take this approach for anxiety specifically. For example, Stockings et al. (2016) identified only one selective study that assessed the emergence of anxiety disorders, although nine studies reported on changes in anxiety symptoms. In both cases, prevention was associated with reduced anxiety in comparison to (typically inactive) controls immediately after the intervention, but there was no evidence of ongoing benefits at later time points. In the case of indicated prevention, again only one study assessed emergence of anxiety disorders, although this did find a significant effect 12 months later. However, on the basis of the 17 studies that reported on change in anxiety symptoms, there was no evidence of a significant reduction in symptoms at any assessment time point.

The variability in outcomes across targeted (selective and indicated) prevention programmes for anxiety may, at least in part, reflect the different criteria by which 'at risk' youth are defined and identified. Risk factors for the development of anxiety disorders (and internalizing problems more broadly) have been examined in only a small number of longitudinal studies and can be grouped in to three categories: social-environmental factors (e.g. socioeconomic status), family factors (e.g. parental psychopathology, stress, behaviours) and individual child factors (e.g. temperament, early symptomatology, attachment). Taking these in turn there is evidence that low socioeconomic status (SES) at birth (Leech, Larkby, Day, & Day, 2006) and at age 2–3 years (Ashford, Smit, Van Lier, Cuijpers, & Koot, 2008) significantly predict internalizing symptoms at 10–11 years. In terms of family factors, recent longitudinal studies that have focused on the development of anxiety disorders specifically have highlighted a potentially important role of parental psychopathology and behaviours. For example, both Hudson and Dodd (Hudson & Dodd, 2012) and Rapee (2014) found significant associations between maternal anxiety symptoms in preschoolers and child anxiety disorders at 8–9 years and 15 years respectively. These findings are consistent with others that have found an increased rate of anxiety disorders among the offspring of parents with anxiety disorders. In a recent meta-analysis, offspring of parents with anxiety disorders were found to be at increased risk of having an anxiety disorder compared to offspring of parents with no mental disorder (RR = 2.07, 95% CI, 1.73–2.48) and compared to offspring of parents with a different mental disorder (RR = 1.32, 95% CI, 1.18–1.49; Lawrence & Creswell, 2016). Hudson and Dodd (2012) also found a significant association between parental overinvolvement when their children were preschoolers and subsequent child anxiety disorders, although there was no significant association with parental negativity.

In terms of individual child characteristics, the most widely examined predictor of later anxiety disorders is behavioural inhibition (BI), the temperamental pattern characterized by fear and withdrawal in unfamiliar situations (Degnan & Fox, 2007). For example, in the Hudson and Dodd (2012), Rapee (2014) and Frenkel et al. (2015) studies, high BI among preschoolers predicted later anxiety disorders. There were a few notable findings; in Rapee (2014), high BI only predicted the development of social anxiety disorder (whereas high maternal anxiety predicted both social and other anxiety disorders); in Hudson and Dodd (2012) there was no evidence that early insecure attachment also predicted later anxiety disorders; and Frenkel et al. (2015) found that high BI predicted anxiety disorder only for those who, during adolescence, reported low involvement in socially active networks.

The extent to which the risk factors associated with childhood anxiety disorders are independent remains unclear. For example, family SES may moderate child risk by its influence on severity of parental psychopathology, parenting responses, family disruption and wider stressors (e.g. Beidel & Turner, 1997; Merikangas, Avenevoli, Dierker, & Grillon, 1999; Merikangas, Dierker, & Szatmari, 1998). Parental psychopathology (particularly anxiety) may, in turn, raise the risk of other mechanisms implicated in the development of child anxiety (Creswell, Cooper, & Murray, 2015). For example, (Murray et al., 2008) found that mothers with Social Anxiety Disorder expressed higher levels of anxiety than nonanxious mothers within a social referencing paradigm when their child was 10 months, which itself predicted increased infant avoidance of a stranger 4 months later – particularly among high BI infants (Murray et al., 2008). These findings also highlight the potential interactive nature of environmental/family factors and child characteristics in which children who are temperamentally predisposed

to anxiety/inhibition may be susceptible to other risk factors in their environment. This suggestion is consistent with the longitudinal findings of Ashford et al. (2008) in which there was a cumulative effect of risk factors measured from 2 years on internalizing problems measured at 11 years of age. Specifically, low SES, family psychopathology at 2–3 years, and parenting stress and child internalizing symptoms at 4–5 years each independently predicted child internalizing problems at 11 years; however, although the presence of one risk factor was associated with a 15.5% risk (vs. 6.4% risk with no risk factors), two or more risk factors was associated with a 48% risk of later internalizing problems. Ashford et al. (2008) concluded that if these early risk factors were effectively ameliorated, up to 57% of cases of internalizing problems among 11 year olds could be avoided.

This systematic review sets out to establish how far we are towards achieving this goal by reviewing randomized, controlled trials that set out to prevent problematic levels of child anxiety among 'at risk' children. In line with the literature outlined above we have taken a broad approach to risk status, including studies that determine risk on the basis of environmental, family and/or child characteristics (and as such including both indicated and selective prevention) and examine the extent to which the particular risk factor targeted moderates child outcomes. A broad range of other factors have been implicated (albeit inconsistently) in the variability in effectiveness of prevention programmes, in particular child age, gender and characteristics of the intervention (i.e. its content, who delivered it, who it was delivered to and in what format). As such we have also examined their moderating effects here. Because of our focus on targeted prevention for 'at-risk' children, we have only included studies where these risks were established for individual children, that is, a subgroup of children are targeted from within a broader population; and, because of our focus on prevention, we have also only included studies that do not include children with identified anxiety disorders. On this basis, we examined the following research questions: (a) Is targeted prevention associated with a reduction in the onset of anxiety disorders in at-risk youth; (b) Is targeted prevention associated with a reduction in anxiety symptom severity in at-risk youth; (c) Are the effects of targeted prevention moderated by child age, gender, type and format of intervention, who delivered and participated in the intervention, and the type of risk. In all cases, comparisons were conducted versus both wait list and active control conditions and both following the intervention and at longer term follow-up time points where available.

Methods

Protocol

Methods of the analysis, inclusion and exclusion criteria were specified in advance and documented in a protocol registered on the International Prospective Register of Systematic Reviews (PROSPERO; protocol number: CRD42017055312).

Eligibility criteria

Inclusion and exclusion criteria were drafted and then refined after piloting using a subsample of papers. A study was selected for inclusion if:

1 It included an active intervention which aimed to reduce anxiety symptoms and/or prevent the emergence of anxiety disorders in children/adolescents.

2 Its participants were children or adolescents. Studies were excluded if the mean age of the children/adolescents was over 18 years or the sample included adults over 21 years.

3 Its participants were selected for inclusion on the basis of being individually 'at-risk' of the development of an anxiety disorder as included in DSM5. Studies were excluded if they included children identified as having an anxiety disorder.

4 It reported outcomes using a recognized diagnostic tool for a DSM5 anxiety disorder, or a validated measure of anxiety symptoms using standardized scores.

5 It used a Randomized, Controlled Trial (RCT) design to compare a preventative intervention with a waitlist and/or an active comparison condition. Studies that provided qualitative data only and those that did not include any new data (e.g. reviews) were excluded.

6 It was published in a peer-reviewed journal.

In order to reduce bias, papers written in languages other than English were not automatically excluded, and instead an attempt was made to gain the required information in English. Where this was not possible, these studies were excluded. As the focus of the review was prevention among children identified as being 'at-risk' from the general population, studies that focused on children with intellectual disabilities, neurodevelopmental disorders or specific health conditions were excluded.

Information sources and search terms

The search was performed in October 2016 using the following electronic databases; Scopus, Ovid, PsycINFO, Pubmed and CINAHL. Details about the search strategy and syntax for each database are contained in the protocol available via PROSPERO.

No limitations were used for date of publication or language. The initial search identified 3070 records (following de-duplication). A hand search was also completed, including a search of references from previous reviews with related topics.

Study selection

Two authors (SR and either PL or one of two research assistants) independently screened the abstracts of all retrieved references for eligibility. An abstract included by any rater was included in the full text stage. These articles were then read in full and rated again by two authors independently (SR, PL). There was 93.5% agreement on inclusion between raters (Kappa = 0.76). Disagreements were discussed and reviewed by SR, PL and CC, and an agreement was reached in all cases.

On completion of the selection process (see Figure 1), 16 records were deemed eligible for this review.

Summary of measures

The primary outcomes for this review were anxiety symptom severity and anxiety diagnosis.

Data extraction

Relevant data for each measure were collated alongside relevant information about the participants and the intervention. Table 1 provides a summary of this information (a full list is available on request).

Synthesis of results

Data extraction and statistical analysis. The R statistical environment was used for analysis, with the metafor package for meta-analysis (Viechtbauer, 2010). We conducted meta-analyses to address all research questions as long as there were at least two eligible studies; however, if there were less than five

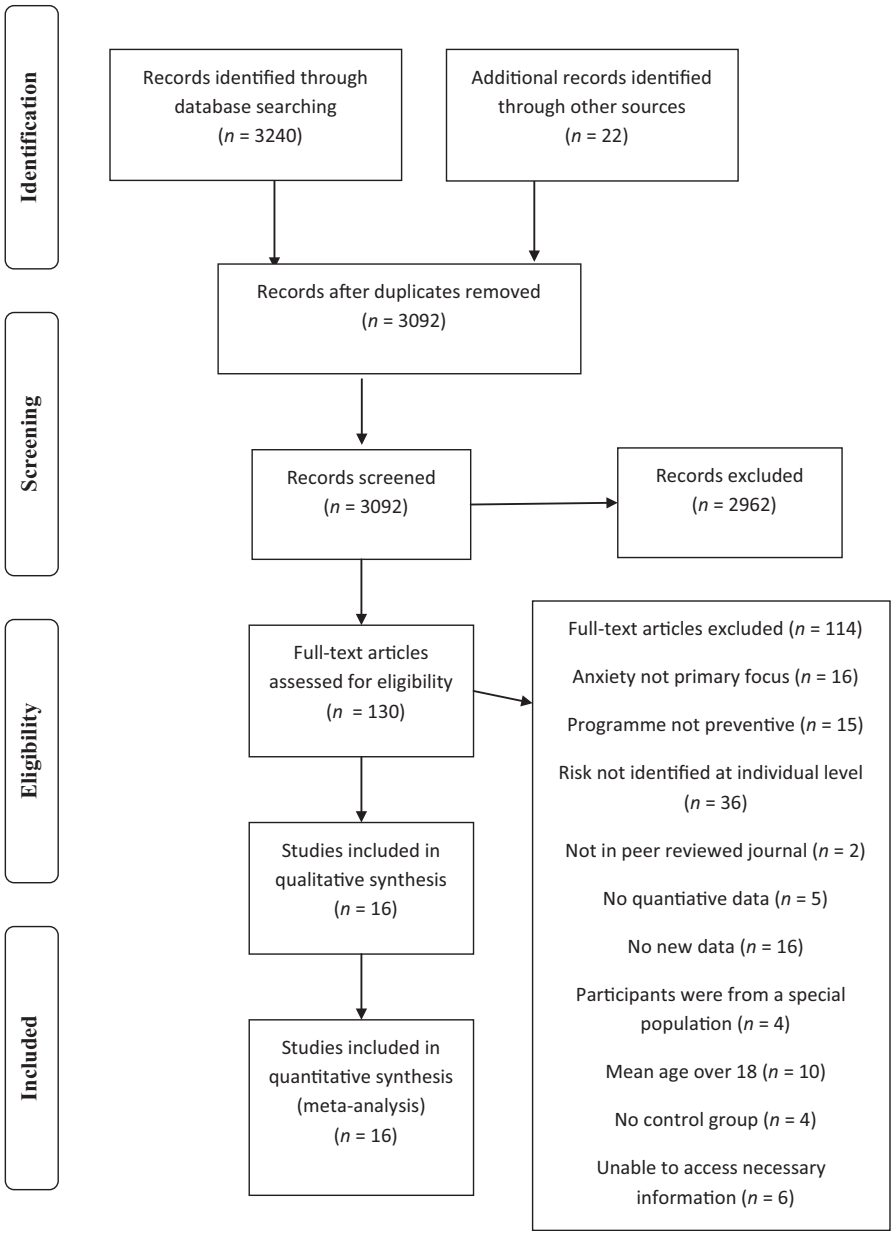

Figure 1. Preferred Reporting Items for Sytematic Reviews and Meta-Analyses (PRISMA) flow diagram of selection of studies

eligible studies we required the studies to examine a similar intervention and use a similar outcome measure.

For diagnostic outcome reports, risk ratios (RR) were calculated. For continuous outcome measures, standardized mean differences (SMD) were calculated for each trial by subtracting mean change from pre- to postintervention in the control group from the mean change from pre- to postintervention in the experimental group, divided by the pooled standard deviation for the control and experimental groups at pretreatment (Morris, 2007). Random and mixed effects models were used in light of the natural heterogeneity between trials (Higgins & Thompson, 2002), using Hedge's *g* as the pooled effect size. To calculate the impact of heterogeneity between trials, the I^2 statistic was calculated (Higgins, Thompson, Deeks, & Altman, 2003). Only one study (Dobson, Hopkins, Fata, Scherrer, & Allan, 2010) reported more than one anxiety symptom outcome [Beck Anxiety Inventory (BAI) and Mood and Anxiety Symptom Questionnaire (MASQ)], and neither of these was used in any of the other studies so we chose the BAI, on the basis that it appeared to be the primary measure of anxiety in this study. Metaregressions were conducted to assess for moderation of effects by continuous (age, number of sessions, proportion of female to male participants) and categorical [Cognitive Behavioural Therapy (CBT)] or other treatment, treatment delivered by psychologist, teacher or other, individual or group format, child-only sessions, or parent involvement) variables.

Coding of study quality. Two authors (SR and PL) independently assessed the quality of each study using the quantitative study quality tool (Kmet, Lee, & Cook, 2004). Domains assessed include risk of bias and description of study objectives, sample size, analysis description and reported estimates of variance for primary outcomes.

Publication bias. The risk of publication bias was assessed using funnel plots and Egger tests.

Results

Sixteen studies met entry criteria. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) selection flow chart is presented in Figure 1

Table 1. Studies of Preventive Programmes for Children and Young People Individually Identified as At Risk of Anxiety Disorders

Study	*N*	Age mean (range)	Gender %F	Nature of risk	Prog type	Cont type	Sessions (min)	Who attends	Format	Dx Tool	Anx Sx Tool	Rater	F/U
Balle and Tortella-Feliu (2010)	92	13.63 (11–17)	61	Anx Sens	CBT (Spanish FRIENDS)	W/L	6 (45)	Y/P	Group	None	Catalan SCAS	Y/P	6
Bar-Haim, Morag, and Glickman, (2011)	34	10.1 (10)	71	Anx Sx	ABM	Att	2 (8 blocks of 96 trials) (60)	Y/P	Indiv	None	STAIC	Y/P	None
Berry and Hunt (2009)	46	13.04 (12–15)	0	Anx Sx + bullying victim (BIS)	CBT (CKP)	W/L	8 (60)	Y/P + parents separate groups	Group	None	SCARED	Y/P and parent	3
Dobson et al. (2010)	46	15.26 (13–18)	69.6	Dep Sx	CBT	Att	15 (45)	Y/P	Group	None	BAI (MASQ also used)	Y/P	3 and 6
Ginsburg (2009)	40	8.94 (7–12)	45	Parent Anx Dx	CBT (CAPS)	W/L	6–8 + 3 boosters (60)	All family (parents only at first 2)	Family	ADIS C/P	SCARED	Y/P and parent	6 and 12
Ginsburg et al. (2015)	136	8.69 (6–13)	55.9	Parent Anx Dx	CBT (CAPS)	Inf. mon.	8 + up to 3 boosters	All family (parents only at first 2)	Family	ADIS C/P	ADIS CSR	Y/P and parent	6 and 12
Gutierrez-Maldonado, Magallon-Neri, Rus-Calafell, and Penaloza-Salazar (2009)	36	11:09 (10–15)	63.9	Anx Sx	VR Exp	W/L	8	Family	Indiv	None	FSSC-R	Y/P	None
Hiebert et al. (1989)	40	15.6 (15–17)	75	Anx Sx	PMR	Att or N/C	8	Y/P	Individual	None	STAI	Y/P	None
Kosters et al. (2015)	496	10.6 (8–13)	62.5	Anx Sx	CBT Dutch FRIENDS	W/L	10 + 1 booster	Y/P	Group	None	RCADS	Y/P	6
Liddle and Macmillan (2010)	58	Not reported (8–14)	46.6	Anx Sx/Dep Sx,/low self-est	CBT FRIENDS	W/L	10	Y/P	Group	None	SCAS	Y/P and parent	None
Mifsud and Rapee (2005)	91	9.5 (8–11)	59	Anx Sx and low SES area	CBT Cool Kids	W/L	8 (weekly)	Y/P	Group	None	SCAS	Y/P and parent	4
Miller et al. (2011)	191	10.1 (9–12)	48	Anx Sx	CBT FRIENDS	W/L	9	Y/P	Group	None	MASC	Y/P	12
O'Leary-Barrett et al. (2013)	1024	13.7 (13–14)	42.9	Anx Sens	CBT	N/C	2	Y/P	Group	None	BSI	Y/P	24
Scholten, Malmberg, Lobel, Engels, and Granic (2016)	138	13.3 (11–15)	65	Anx Sx	Biofeedback video game	Video game	6 (in 3 weeks)	Y/P	Indiv	None	SCAS	Y/P	3
Shen (2002)	30	Not reported (8–12)	53.3	Survived earthquake and high risk for maladjustment.	Play therapy	N/C	10	Y/P	Group	None	RCMAS	Parent	None
Siu (2007)	47	8.4 (7–10)	46.8	Int Sx	CBT FRIENDS	W/L	8	Y/P	Group	N/A	CBCL SCARED	Y/P	None

ABM, Attention Bias Modification; ADIS C/P, Anxiety Disorders Interview Schedule, Child Version; ADIS CSR, ADIS Clinician Severity Rating; Anx Dx, Anxiety Diagnosis; Anx Sens, Anxiety Sensitivity; Anx Sx, Anxiety Symptoms; Att, Attention Control; BAI, Beck Anxiety Inventory; BIS, Bullying Incidence Scale; CAPS, Coping and Promoting Strength Programe; CBCL, Child Behaviour Checklist; CKP, Coping Kids Programme; Cont type, Control typeDep Sx, Depression symptoms; Dx Tool, Diagnostic Tool; F/U, Follow-up; Format: Indiv, Individual; FSSC-R Fear Survey Schedule for Children Revised; Inf. mon, Information and monitoring; Int Sx, Internalizing symptoms; Low self-est, low self-esteem; MASC, Multidimensional Anxiety Scale for Children; MASQ, Mood and Anxiety Symptom Questionnaire; Mo, Mother; N/A, Not applicable; N/C, No contact; PMR, Progressive Muscle Relaxation; Prog Type, Programme Type; RCADS, Revised Child Anxiety and Depression Scale; RCMAS, Revised Children's Manifest Anxiety Scale; SCARED, Screen for Child Anxiety Related Disorders; SCAS, Spence Children's Anxiety Scale; STAI, State-Trait Anxiety inventory; STAIC, State-Trait Anxiety Scale for Children; VR Exp, Virtual Reality Exposure; W/L, Waiting list; Y/P, Young Person.

(Moher, Liberati, Tetzlaff, & Altman, 2009). Retained studies included a total of 2545 participants at risk for anxiety disorders.

For diagnostic outcomes, only two studies were identified for inclusion. Risk ratios were calculated and pooled using a random-effects model. Risk ratios tell us the likelihood of an outcome (here, diagnosis of anxiety disorder) for those receiving a preventative intervention rather than a control. At each assessment, diagnosis of anxiety disorder was significantly less likely in the group that had received the prevention programme, and there was nonsignificant heterogeneity: at the end of the programme (RR = .09, 95%CI = .02 to .16; Q = .52, p = .47, I^2 2 = .00)); at 6-month follow-up (RR = 0.17, 95% CI = .06 to .27; Q = .013, p = .91, I^2 = 0.00); and at 12 month follow-up (RR = .31, 95%CI .17 to .45; Q = .09, p = .77, I^2 = .00; see Figure 2).

When continuous (symptom measure) outcomes were compared to an inactive control group, young people reported a significant small to moderate (SMD = −.43, 95%CI = −.73 to −.12) effect at the end of the preventive programme (Figure 3A). There was a large amount of heterogeneity between studies in this analysis (Q = 32.67, p < .000, I^2 = 72.2%). In comparison to an attention control, the effect size fell (SMD = −.09, 95% CI = −.28 to .10), and was nonsignificant (Figure 3B). There was nonsignificant heterogeneity in this effect (Q = 1.72, p = .79, I^2 = .00). At follow-up assessed up to 6 months after the prevention programme, data were adequate to allow analysis only for studies with an inactive control group. Where follow-up was conducted within 6 months of the end of the prevention programme, the effect was significant (SMD = −.46, 95% CI = −.62 to −.30), with nonsignificant heterogeneity (Q = 3.07, p = .38, I^2 = .00). Follow-up assessments reported beyond 6 months extended to 24 months (O'Leary-Barrett et al., 2013). There was a significant effect for studies comparing prevention to a wait list control (SMD = −.32, 95%CI = −.63 to −.01). There was significant heterogeneity of effect sizes (Q = 13.23, p < .01, I^2 = 81.89). Forest plots (Figure 3C and D) show the results of these analyses visually. The analysis of follow-up of trials with an attention control group was not possible because only one study (Dobson et al., 2010) reported these data.

Five studies included parents' reports on offspring anxiety symptoms at their end-of-programme evaluations. These were all compared to nonattention controls, and yielded a small effect size (SMD = −.40, 95% CI = −.63 to −.17; See Figure 4). There was nonsignificant heterogeneity (Q = 5.76, p = .22, I^2 = 10.6%). Only two studies included parents' symptom reports at follow-up assessments. At 6 months, there was a larger, but nonsignificant, effect (SMD = −.45, 95%CI = −.04 to 0.15), and at 12 months, a larger and significant effect (ES = −.45, 95%CI = −.75 to −.15). There was nonsignificant heterogeneity at both follow-up time points: at 6 months (Q = 2.92, p = .09, I^2 = 65.8%), and at 12 months (Q = .12, p = .73, I^2 = 0.0%).

Metaregression analyses showed that none of the putative moderators had a significant impact on the effect of prevention on symptoms of anxiety reported by the young people at risk (p = .24 to .93).

Studies varied in terms of quality (see Table S1). The major concerns across studies were in how randomization was achieved and the blinding of researchers and participants to participants' status (experimental or control). In addition, studies did not consistently report variance statistics (such as confidence intervals or standard errors).

Visual inspection of funnel plots and Egger's intercept regression tests showed no significant evidence of publication bias for continuous measured outcomes (z = −1.08, p = .28) (see Figure S1). For diagnostic outcomes, the Egger test was not conducted (Higgins & Green, 2011).

Discussion

Our review identified only two studies that examined the effect of a prevention programme on the onset of child anxiety disorders. Findings from these studies were in the expected direction, with a 91% reduction in risk of anxiety disorder diagnosis at the end of the programme and 69% by 12-month follow-up in those who received a prevention programme (Coping and Promoting Strength, CAPS) compared to those who did not. More studies compared outcomes based on self- reported anxiety symptoms. In this case, there was a small and significant effect compared to a wait list control (based on 10 studies; SMD = −.43) and a small, but insignificant, effect compared to an attention control condition at the end of the intervention (based on five studies) (SMD = −.09). The effect of prevention programmes increased up to 6 months after the intervention, but then fell at follow-up assessments between 12 and 24 months. When parents reported on young people's anxiety symptoms, effects were in the small range at each time point compared to nonattention controls, although were not significant at 6-month follow-ups. Across diagnostic and symptom outcomes, and self- and parent-reports, there were inadequate data to compare outcomes at follow-up to attention controls. Hence, it remains unclear whether those effects found compared to waitlist controls are purely a result of response bias as a result of taking part in a prevention programme and/or the effects are specific to a particular prevention programme.

This meta-analysis is unique in that it has only included trials where young people were individually identified as at-risk and had not been identified as having an anxiety disorder before beginning the prevention programme. Hence, the results are only indirectly comparable to those of previous meta-analyses (Fisak, Richard, & Mann, 2011; Stockings et al., 2016). For example, Fisak et al. (2011) included children targeted on the basis of characteristics of the wider population rather than the individual participants and found a mean postintervention effect of .26 across targeted prevention programmes versus wait list controls. Stockings et al. (2016) considered indicated and selective prevention programmes separately. Selective programmes were not associated with significant reductions in anxiety diagnoses (RR = .8, 95%CI = .60 to 1.07), although this was based on only a single study. However, selective programmes did lead to significant reductions in anxiety symptoms at 1–3 months after the intervention (ES = −.69, 95%CI = −1.08 to −.30) compared to active and assessment only controls; however, significant findings were based on only one of nine studies and there were no significant effects at longer term follow-up

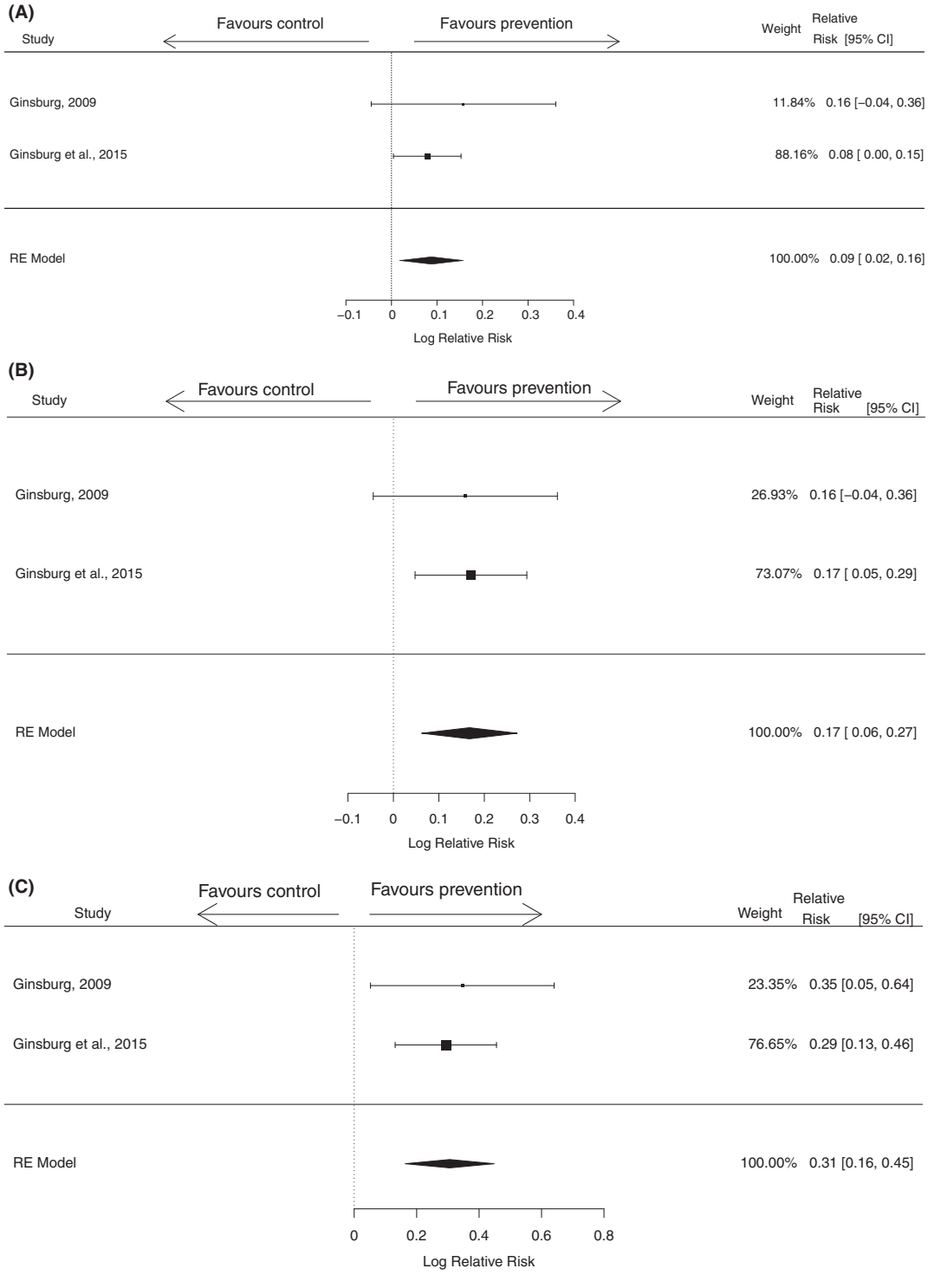

Figure 2. Forest plots of meta-analysis of effects of Anxiety Disorder prevention programmes on Anxiety Disorder diagnostic outcomes. *Note:* A: end-of-programme; B: 6-month follow-up; C: 12-month follow-up

assessments. When it came to indicated prevention programmes, only one study reported effects on disorder development, and this was significant at 12 months (RR = .31, 95%CI = .1 to .98). There was no significant reduction in anxiety symptoms in the indicated programmes at any assessment time point. Notably the Stockings et al. (2016) review included some studies with children identified as having an anxiety disorder before beginning treatment (Dadds, Spence, Holland, Barrett, & Laurens, 1997; Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2005; Simon, Bogels, & Voncken, 2011). Despite some differences in the approach

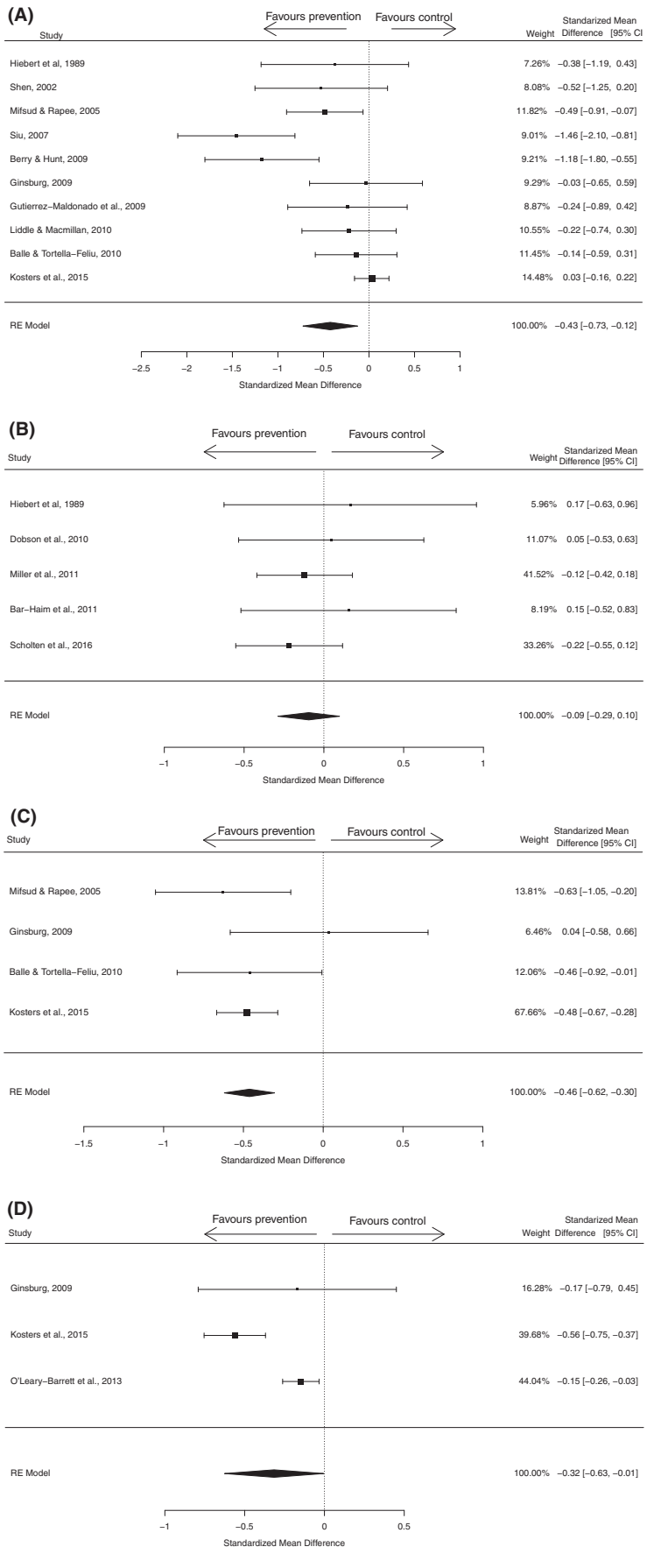

Figure 3. Forest plots of meta-analysis of effects of Anxiety Disorder prevention programmes on self-reported anxiety symptoms. *Note:* A: end-of-programme versus waitlist control; B: end-of-programme versus active control; C: 6-month follow-up; versus waitlist control; D: 12–24-month follow-up versus waitlist control

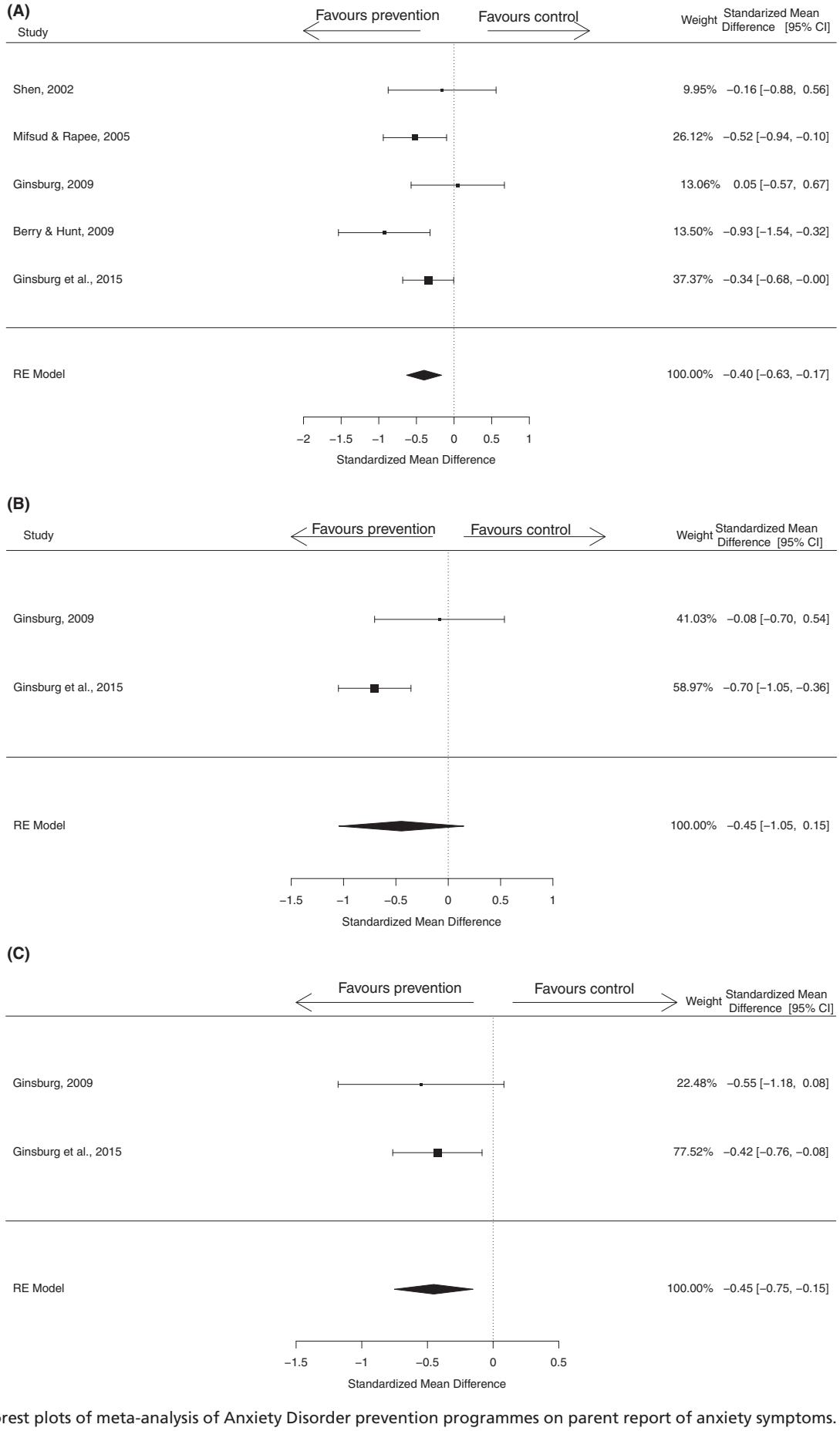

Figure 4. Forest plots of meta-analysis of Anxiety Disorder prevention programmes on parent report of anxiety symptoms. *Note:* A: end-of-programme; B: 6-month follow-up; C: 12-month follow-up

followed, the results from our analyses compare favourably to those of previous analyses in terms of diagnostic and symptom severity outcomes.

Identifying risk

The studies included in this review identified children at risk of anxiety disorders on the basis of family factors (parental anxiety disorder) and child factors (heightened anxiety symptoms and sensitivity and being the victim of bullying). None of the studies that we identified targeted children on the basis of their individual socioenvironmental risk. Rather, where SES was addressed, children were drawn from samples where, for example, participants attended a school where a significant number of children had low family incomes (for example, Mifsud & Rapee, 2005). It is also important to note that only one study identified at-risk children on the basis of more than one risk factor (Berry & Hunt, 2009) given evidence from Ashford et al. (2008) regarding cumulative risks leading to significantly worse outcomes.

Modifying risk

What we know about risk has not always informed the content of prevention programmes. For example, interventions have not typically actively set out to alter the characteristics which identified children as 'at risk', for example, socioeconomic deprivation, parent anxiety disorder. Instead, interventions have often targeted factors that are presumed to *maintain* anxiety disorders (e.g. Kosters, Chinapaw, Zwaanswijk, van der Wal, & Koot, 2015; Miller et al., 2011) or to improve resilience (e.g. Hiebert, Kirby, & Jaknavorian, 1989). Furthermore, many prevention programmes have omitted a focus on modification of evidenced risk factors such as parent–child interactions (Majdandzic, Moller, de Vente, Bogels, & van den Boom, 2014; Murray et al., 2008; Rubin, Nelson, Hastings, & Asendorpf, 1999). A clear exception to this is the CAPS programme (Ginsburg, 2009; Ginsburg, Drake, Tein, Teetsel, & Riddle, 2015), where parent risk factors, such as anxiety-enhancing behaviours, are an explicit target.

Clinical implications

Clinically, the strongest results of the studies included in the review were from Ginsburg (2009); Ginsburg et al. (2015), where the CAPS programme showed significant preventive effects against the onset of anxiety disorder at the end of the programme (91%) and 12 months later (69%), and the reduced risk exceeded the target of 57% set by Ashford et al. (2008) despite children being identified as at-risk on the basis of one risk factor (parental anxiety disorder). The CAPS programme explicitly targets established risk factors for the development of anxiety disorder such as parental modelling of anxious behaviours and anxiety-enhancing parental responses (Ginsburg, 2009). It is highly plausible that targeting these risk factors accounts for the programme's effectiveness, although this has not been directly examined.

Notable outcomes from other studies include those from Siu (2007) and Berry and Hunt (2009), which both reported large effect sizes ($g = -1.46$, 95%CI -2.1 to $-.81$; $g = -1.18$, 95%CI = -1.8 to $-.55$ respectively) on symptoms at the end of the programme compared to a waitlist control; and Mifsud and Rapee (2005), where medium effect sizes ($g = -.63$, 95%CI = -1.05 to $-.2$) on symptom measures were reported by young people at 6-month follow-up. Siu (2007) examined the CBT-based FRIENDS programme with children identified on the basis of elevated self-reported internalizing symptoms in Hong Kong and the findings highlight the promise of prevention programmes in cultures where CBT-based programmes have to date received relatively little attention. The other two notable studies included participants on the basis of two risk factors. Specifically, Berry and Hunt (2009) identified participants on the basis of elevated anxiety symptoms and being victims of bullying; and Mifsud and Rapee (2005) identified participants on the basis of elevated anxiety symptoms and attending a school in a socioeconomically disadvantaged areas (although some of these young people might not have individually been socioeconomically disadvantaged). The positive results from these two studies are consistent with the results of Ashford et al. (2008) in that prevention programmes might be most beneficial to those with multiple risk factors for the development of anxiety although this has not been directly tested.

Limitations of included studies

The absence of assessment of anxiety diagnoses from 14 of the 16 studies means that the central question of this meta-analysis regarding the prevention of anxiety disorders in at-risk youth has been addressed by only two studies, and our confidence in our answer is commensurately limited. This limitation also means that many studies are likely to have included children who would have been identified as having an anxiety disorder at baseline had this been assessed. For example, in the study by Kosters et al. (2015), mean anxiety symptom score was between 1.5 and 2 standard deviations above the general population. This suggests that, even though none of the children was identified as having an anxiety disorder, had they been assessed against diagnostic criteria, many might have met them. Given this, our results should be treated with caution because, although we have excluded those with identified anxiety disorders, we were naturally unable to exclude those with unidentified anxiety disorders. It is of note that the two studies that did formally establish that all children did not have anxiety disorders at the outset (Ginsburg, 2009; Ginsburg et al., 2015) were the same two studies identified on the basis of parental anxiety disorder and where effect sizes were relatively high.

The majority of studies that reported on symptoms as outcomes, were most frequently only child self-reports. Recent studies show that parent report is a better predictor of anxiety diagnostic status than child report, at least with children up to 13 years of age (Evans, Thirlwall, Cooper, & Creswell, 2016; Villabø, Gere, Torgersen, March, & Kendall, 2012). Furthermore, studies invariably only reported on mean anxiety symptoms, so we were unable to assess the frequency of cases where there was a clinically meaningful impact on children's anxiety symptoms.

The content and format of prevention programmes varied across studies. For example, six studies reported a provision for parent involvement in their prevention programme although two of these reports did not specify the rates of parent involvement (i.e. stating only that parents were invited to participate in two sessions, not whether any did). As such, our finding that parent

involvement did not moderate the effectiveness of prevention programmes needs to be interpreted with caution. Programmes also differed in their inclusion of booster sessions beyond the end of the programme, with the majority (13) including no booster sessions. From the adult literature on the treatment of anxiety disorders (Craske et al., 2006, 2009), booster sessions appear to contribute positively to outcomes and this is a clear area for further evaluation.

Studies also differed in key methodological characteristics. Twelve studies used a nonattention control group for comparison to the prevention group; in nine, a waitlist. An active control was used in five studies. There was variability in what the attention control groups received: for example, group discussions of topics of interest to adolescents, such as role models, drugs and alcohol (Dobson et al., 2010); being read an adventure story such as *Harry Potter* in small groups (Miller et al., 2011); or biofeedback training (Hiebert et al., 1989). Despite longer term outcomes being of particular interest in preventive efforts, follow-up assessments were only included in seven studies (only one of which had an attention control) and ranged from 3 to 24 months. As such our analyses are grouped, arguably arbitrarily, by those that occurred up to 6 months after the end of the prevention programme and between 12 and 24 months. The relative absence of long-term follow-up in most studies severely limits our ability to reach conclusions about preventive effects.

Limitations of our review

The conclusions we have been able to draw from our analyses are unable to support firm answers to central questions, including whether programmes to prevent the onset of anxiety disorders for children and young people identified as at risk of developing anxiety disorders are effective. Evidence is tentative at best, being based on only two studies. Our conclusions regarding the effectiveness of programmes where anxiety symptoms (not disorders) were assessed are limited in two important ways. First, it is very likely some participants, had they been assessed for anxiety disorders, would have met criteria for a diagnosis of at least one anxiety disorder. This is important because it means the programmes could have been functioning as both prevention and early intervention, clouding the picture about effectiveness as prevention programmes. Second, we have been unable to examine study data at the participant level. This is important because it means we have only been able to analyse whether symptom changes were greater in one group or the other (or neither), but not whether either or both groups reported clinically meaningful symptom changes.

We were unable to evaluate whether particular interventions were of particular benefit due to the varied ways in which they were delivered. For example, the FRIENDS programme was administered in 5 of 11 CBT studies; however, it varied in terms of the number of sessions, number of participants per group, participant ages and inclusion of booster sessions. As such, in some cases, FRIENDS programmes may have been more similar to the non-FRIENDS comparator than to other versions of FRIENDS.

Unfortunately three potentially eligible reports were inaccessible so could not be included in the review. We were also limited by a lack of available data to fully evaluate moderators. For example, age ranges were typically broad and as such the mean age limits the clarity of the picture that results from this analysis. Moderation on the basis of risk factor was also limited to elevated anxiety symptoms, heightened anxiety sensitivity, parent anxiety disorder and being a victim of bullying and none of the other risk factors for the development of anxiety disorders, including individual socioeconomic status (Leech et al., 2006); parent–child interactions characterized by anxiety (Murray et al., 2014), child behavioural inhibition (Fox et al., 2005) and, possibly even more informatively, combinations of these individual risk factors (Hudson & Rapee, 2004; Kennedy, Rapee, & Edwards, 2009; Rubin, Coplan, & Bowker, 2009). Notably, studies that have intervened with children with elevated behavioural inhibition have been conducted, with favourable results, but were excluded from this review because many of the children identified as at-risk had already developed anxiety disorders (e.g. Kennedy et al., 2009; Rapee, 2013).

What to do in future studies

The findings of this review lead to key suggestions for future anxiety disorder prevention studies. First, diagnostic status must be assessed before and after the prevention programme so we can draw conclusions about whether the programmes actually prevent the onset of anxiety disorders. Second, studies should directly examine the potential enhanced effects of prevention by identifying young people for inclusion on the basis of more than one evidence-based risk factor. Third, prevention programmes must not only include those identified as at most risk, but must then target the malleable risk factors that place them at risk. Eleven studies analysed used programmes based on generic cognitive behavioural models of maintenance of anxiety disorders without additional components to address known risk factors. Programmes excluded from this review (because children had already developed anxiety disorders at baseline) such as Kennedy et al. (2009) have shown the feasibility and effectiveness of this approach; they not only identified children on the basis of more than one risk factor (behavioural inhibition and parent anxiety disorder) but also targeted these risk factors directly in their programme. At follow-up, the intervention group not only showed significantly fewer anxiety disorders but also less behavioural inhibition. Prevention programmes that modify malleable risk factors bring the prospect of the scientific benefit of testing putative mechanisms of development of (causal risk factors for) anxiety disorders. Fourth, no studies included identified children as being at risk of any *specific* anxiety disorder, rather than anxiety disorders generally. Programmes have therefore not drawn on the evidence that some risk factors such as behavioural inhibition (Rapee, 2014) might predict the risk of specific anxiety disorders, rather than anxiety disorders in general. Finally, it is essential that clinicians and researchers work closely with families to determine the optimal time, both scientifically and practically, to intervene to prevent the onset of anxiety disorders – critically this needs to be at a time that feels relevant to families and at which they would be willing to engage in preventive interventions and in a way that is acceptable to families and does not feel stigmatising. As a group,

studies on prevention of anxiety disorders among at-risk children show promise and there are some isolated studies with compelling results (e.g. Ginsburg et al., 2015) but clearly, much work remains to be done to identify those children most at risk, to know how best to effectively modify those risk factors to test the causal status of risk factors, and to ultimately alter the developmental trajectories of specific anxiety disorders.

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Supporting information

Additional Supporting Information may be found in the online version of this article:

Figure S1. Funnel plot of studies reporting continuous measures.

Table S1. Quality ratings of included studies.

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